DDWRT VLAN's revisited

(having fun with VAP's, WAP's and VLAN's

Introduction

When the VLAN world was simple and straightforward (at least for Broadcom) I already did a write up how to use VAP's, WAP's and VLAN's but that is now outdated since the introduction of swconfig for Broadcom, so a new write up.
AS I am still learning and have to discover a lot this is a WIP and no definitive answer so please share your results/answers/thoughts/corrections.

Note:
When creating bridges you have to be extremely patient, add a bridge, Apply and wait two minutes before creating another bridge. After you have created all bridges Reboot the router
Then Assign to Bridge, Add and Assign, then Apply and wait two minutes after assignment then assign the next interface to a bridge. In the end Reboot again. If you are not patient the bridge index becomes corrupt and all assignments revert to none

index

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Setup

Before setting this up both routers were reset to defaults

Main router R7800

Netgear R7800 running build 49626
Setup: Gateway, IP address 192.168.5.1

The router has two bridges which have their own IPaddresses/subnet
br1 is associated with VLAN 3
One trunk port to the WAP with VLAN1, VLAN3 and VLAN4 all tagged
One port (swconfig port 2 = port 3 on the router) on VLAN 3 (br1)
One VAP associated with br2 (VLAN 4)

Screenshots of Main router (R7800)

WAN Connection Type

Connection Type	Automatic Configuration - DHCP
Ignore WAN DNS	☑
Use VLAN Priority	☐

Optional Settings

Router Name	R7800-2
Hostname	
Domain Name	
MTU	Auto 1500
Shortcut Forwarding Engine	○ Enable ◉ Disable
STP	○ Enable ◉ Disable

Network Setup

Router IP

Local IP Address	192 . 168 . 5 . 1 / 24
Gateway	0 . 0 . 0 . 0
Local DNS	0 . 0 . 0 . 0

Dynamic Host Configuration Protocol (DHCP)

DHCP Type	DHCP Server
DHCP Server	◉ Enable ○ Disable
Start IP Address	192 . 168 . 5 . 64
Maximum DHCP Users	190
Lease Expiration	1440 min
Static DNS 1	9 . 9 . 9 . 9
Static DNS 2	1 . 0 . 0 . 1
Static DNS 3	0 . 0 . 0 . 0
WINS	0 . 0 . 0 . 0
Use dnsmasq for DNS	☑
DHCP-Authoritative	☑
Recursive DNS Resolving (Unbound)	☐

Create a Bridge

Name	STP	IGMP Snooping	Prio	Forward Delay	Max Age	MTU	Root MAC	Action
br0	Off	Off	32768	15	20	1500	BC:A5:11:3E:71:F1	
br1	STP	Off	32768	15	20	1500	BC:A5:11:3E:71:F1	
br2	STP	Off	32768	15	20	1500	BC:A5:11:3E:71:F1	

Add

Assign to Bridge

Assignment	Interface	STP	Prio	Path Cost	Hairpin Mode	Action
br1	wlan0.1	On	128	100	☐	
br1	vlan3	On	128	100	☐	
br2	vlan4	On	128	100	☐	

Add

Current Bridging Table

Bridge Name	STP	Interface
br0	no	eth1 wlan0 wlan1
br1	yes	vlan3 wlan0.1
br2	yes	vlan4

Port Setup

WAN Port Assignment: eth0

Network Configuration eth1

MAC Address	BC:A5:11:3E:71:F1
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration eth1.3

MAC Address	BC:A5:11:3E:71:F1
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration eth1.4

MAC Address	BC:A5:11:3E:71:F1
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration wlan0

MAC Address	BC:A5:11:3E:71:F3
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration wlan0.1

MAC Address	BE:A5:11:3E:71:F3
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration wlan1

MAC Address	BC:A5:11:3E:71:F4
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration br1

Label	
TX Queue Length	1000
MTU	1500
Multicast Forwarding	○ Enable ◉ Disable
Masquerade / NAT	◉ Enable ○ Disable
Filter WAN NAT Redirection	○ Enable ◉ Disable
Net Isolation	○ Enable ◉ Disable
Forced DNS Redirection	○ Enable ◉ Disable
IP Address	192 . 168 . 53 . 1 / 24
L2Mesh Enable	☐
L2Mesh Bridge	br0

Network Configuration br2

Label	
TX Queue Length	1000
MTU	1500
Multicast Forwarding	○ Enable ◉ Disable
Masquerade / NAT	◉ Enable ○ Disable
Filter WAN NAT Redirection	○ Enable ◉ Disable
Net Isolation	○ Enable ◉ Disable
Forced DNS Redirection	○ Enable ◉ Disable
IP Address	192 . 168 . 54 . 1 / 24
L2Mesh Enable	☐
L2Mesh Bridge	br0

DHCPD

Multiple DHCP Servers

IP Address	Interface	Enable	Start	Max	Lease time	Action
192.168.53.1/24	br1	On	100	50	1440 min	⊖
192.168.54.1/24	br2	On	100	50	1440 min	⊖

Add

VLAN's and R7800

On modern builds you can use the GUI just fine, make sure the CPU port(s) are also tagged if you have more than one VLAN. See: https://forum.dd-wrt.com/phpBB2/viewtopic.php?t=334527

As this is a two armed router (two physical CPU ports to the switch) it is behaving erratically when the GUI (Switch Config) is used.
So what ever happens DO NOT TOUCH the Switch Config tab (not after and not before midnight 😉)

VLAN config on these wo armed routers (e.g. XR500. R7800, EA8500, R7500, Asrock G10) should be done manually with a script using swconfig.
I have added the script below to Startup (Administration/Commands Save as Startup).

Note: in swconfig the switch ports 1-4 are reversed so 1=4 and 2=3

This is the script which has been added

```
## to enable VLANs
swconfig dev switch0 set enable_vlan 1
## tag VLAN 1 on the trunk port 3 which is actually port 2 on the router, this is
necessary
## as the WAP also has VLAN 1 1 tagged on the trunk port (the GUI of the R7000  allows
only all tagged)
swconfig dev switch0 vlan 1 set ports "1 4 3t 6"
swconfig dev switch0 vlan 3 set ports "3t 6t"
## set port 3 (which is port 2 on the router) to VLAN 3 and also the trunk port
swconfig dev switch0 vlan 4 set ports "2 3t 6t"
swconfig dev switch0 set apply

# if you use this then you can address eth1.3 as vlan3 see:
https://ixnfo.com/en/configuring-vlans-in-ubuntu.html
vconfig set_name_type VLAN_PLUS_VID_NO_PAD

vconfig add eth1 3
## you can also use the GUI to add vlan 3 to br1 for better overview
brctl addif br1 vlan3
#ifconfig vlan3 down #  not necessary
ifconfig vlan3 up

# for use if VLAN_PLUS_VID_NO_PAD is NOT used
#brctl addif br1 eth1.3
#ifconfig eth1.3 down #  not necessary
#ifconfig eth1.3 up

vconfig add eth1 4
## you can also use the GUI to add vlan 4 to br1 for better overview
brctl addif br2 vlan4
#ifconfig vlan4 down #  not necessary
ifconfig vlan4 up

# for use if VLAN_PLUS_VID_NO_PAD is NOT used
#brctl addif br2 eth1.4
#ifconfig eth1.4 down #  not necessary
#ifconfig eth1.4 up
```

Secondary router R7000

Netgear R7000, running Community build 52369 (the community build is home made with the community build system and has some extra software which is not important for this paper)
Setup: Wireless Access Point (WAP).
Note you need at least build 52369 as that one has the new and improved Switch config tab with CPU port.

I deviate from the wiki in setting up a WAP and think that the wiki should be updated but that is just my personal opinion.

Note: for Best throughput enable CTF.

A Wireless Access Point (WAP) is secondary router connected wired LAN<>LAN on the same subnet as the primary router:

- On Basic Setup page:
  - WAN disabled
  - DHCP server Disabled (=off and NOT set as Forwarder!)
  - Local IP address in subnet of primary router but outside DHCP scope, make sure the used IP address is unique on your network you cannot have duplicates.
    You can run udhcpc to give the WAP a static lease but because you can it doesn't mean you should ;)
  - Gateway **and** Local DNS pointing to primary router
- Keep DNSMasq enabled (both on Basic Setup page and Services page)
- On Setup > Advanced Routing, keep Operating mode in the default Gateway (the wiki says Router mode but do not do that, either it does not matter (this case) or break things)
- On Security > Firewall keep the **SPI Firewall enabled,** although you do not want a firewall it will be automatically disabled as there is no WAN so no need to change this setting form default.
- Connect LAN <> LAN (**do not use the WAN port** unless you really need that extra port, for most routers traffic still must use the CPU so performance is lacklustre and there are some routers where the WAN port is not added to br0 so the WAN port could be non-functional on some routers).

If you have unbridged VAP's or other applications running on your router you have to add the following rule to the firewall in order to get internet access from the VAP's etc.
In the web-interface of the router (the WAP): Administration/Commands save Firewall:
#Always necessary (alternatively set static route on main router and NAT traffic out via the WAN):
iptables -t nat -I POSTROUTING -o br0 -j SNAT --to $(nvram get lan_ipaddr)

This router was setup via the GUI, Switch Config and Networking tab

- Trunk port on port 4 with tagged VLAN 1, VLAN 3 and VLAN 4
- As the GUI only supports tagging on all ports VLAN 1 is tagged, in this case it is no problem as long as the other side of the trunk port on the Main router VLAN1 is also tagged
- Port 2 added to VLAN3
- Port 3 added to VLAN 4

- br1 created no IP address, as this is just bridging via trunk VLAN 3 to br1 (192.168.53.1) of Main, so an IP address of 192.168.53.x is possible and can even be desirable if you want to reach the GUI on that address after we have enabled isolation on the Main router, however when you use this for IoT you actually do not want the router to be manageable from this subnet)
- br2 created no IP address, as this is just bridging via trunk VLAN 3 to br2 (192.168.54.1) of Main, so an IP address of 192.168.54.x is possible and can even be desirable if you want to reach the GUI on that address after we have enabled isolation on the Main router, however when you use this for IoT you actually do not want the router to be manageable from this subnet)

- VLAN 3 added to br1
- VLAN 4 added to br2

- VAP wl0.1 added to br1

Screenshots of WAP setup

WAN Connection Type

Connection Type	Disabled

Optional Settings

Router Name	R7000
Hostname	
Domain Name	
MTU	Auto 1500
Shortcut Forwarding Engine	Disable
STP	○ Enable ◉ Disable

Network Setup

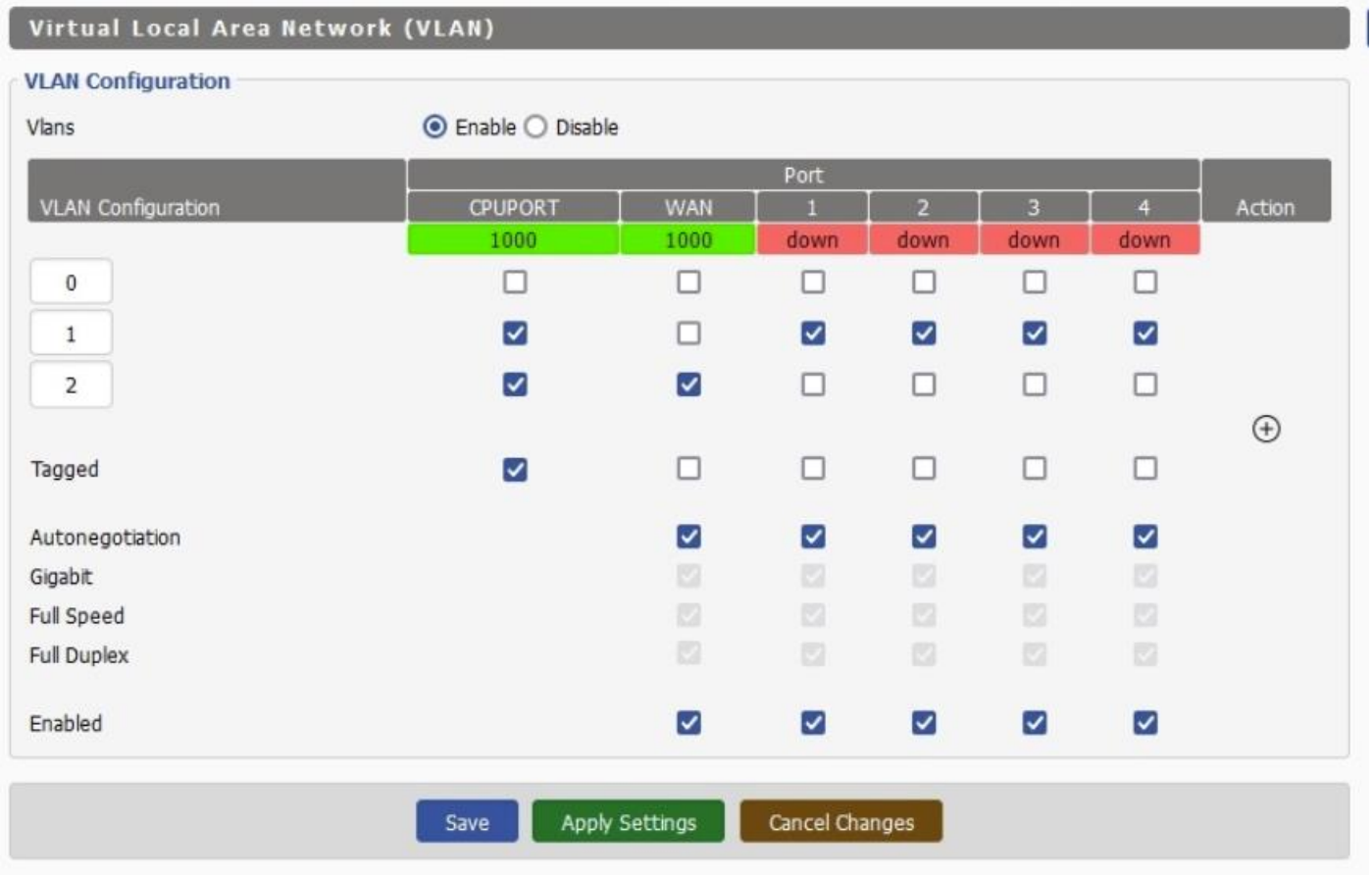
Router IP

Local IP Address	192 . 168 . 5 . 7 / 24
Gateway	192 . 168 . 5 . 1
Local DNS	192 . 168 . 5 . 1

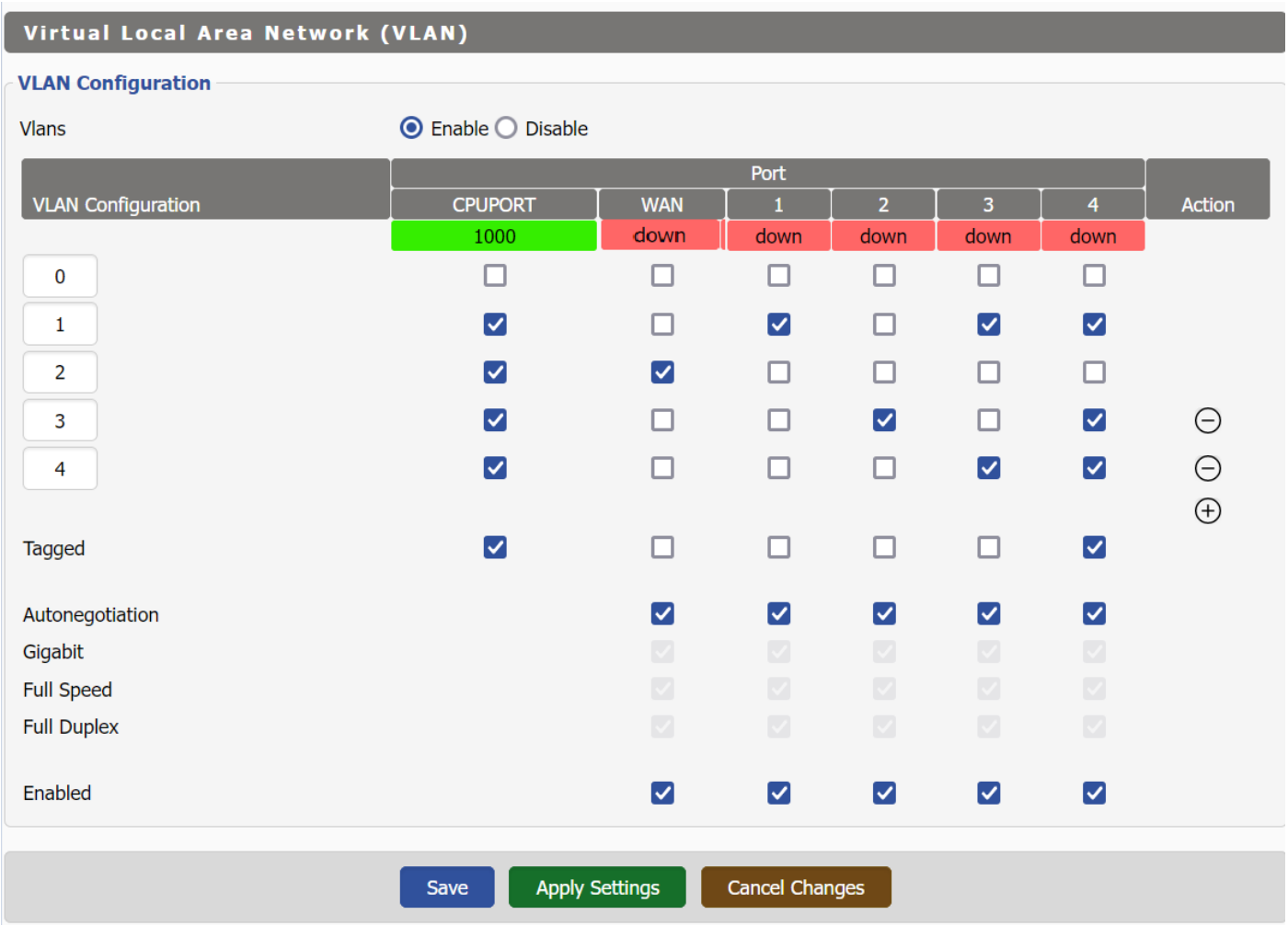
Dynamic Host Configuration Protocol (DHCP)

DHCP Type	DHCP Server
DHCP Server	○ Enable ◉ Disable
Start IP Address	192 . 168 . 1 . 64
Maximum DHCP Users	190
Lease Expiration	1440 min
Static DNS 1	0 . 0 . 0 . 0
Static DNS 2	0 . 0 . 0 . 0
Static DNS 3	0 . 0 . 0 . 0
WINS	0 . 0 . 0 . 0
Use dnsmasq for DNS	☑
DHCP-Authoritative	☑

Default setup:



Trunk port 4 with VLAN 1, 3 and 4:



Tagging

Interface	Tag Number	Prio	Action

Add

Bridging

Create a Bridge

Name	STP	IGMP Snooping	Prio	Forward Delay	Max Age	MTU	Root MAC	Action
br0	Off	Off	32768	15	20	1500	2C:30:33:53:5A:91	
br1	STP	Off	32768	15	20	1500	2C:30:33:53:5A:91	
br2	STP	Off	32768	15	20	1500	2C:30:33:53:5A:91	

Add

Assign to Bridge

Assignment	Interface	STP	Prio	Path Cost	Hairpin Mode	Action
br1	vlan3	On	128	100	☐	
br2	vlan4	On	128	100	☐	
br1	wl0.1	On	128	100	☐	

Add

Current Bridging Table

Bridge Name	STP	Interface
br0	no	eth1 eth2 vlan1 vlan2
br1	yes	vlan3 wl0.1
br2	yes	vlan4

Network Configuration eth1

MAC Address	2C:30:33:53:5A:93
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration eth2

MAC Address	2C:30:33:53:5A:A4
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration vlan1

MAC Address	2C:30:33:53:5A:91
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration vlan2

MAC Address	2C:30:33:53:5A:91
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration vlan3

MAC Address	2C:30:33:53:5A:91
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration vlan4

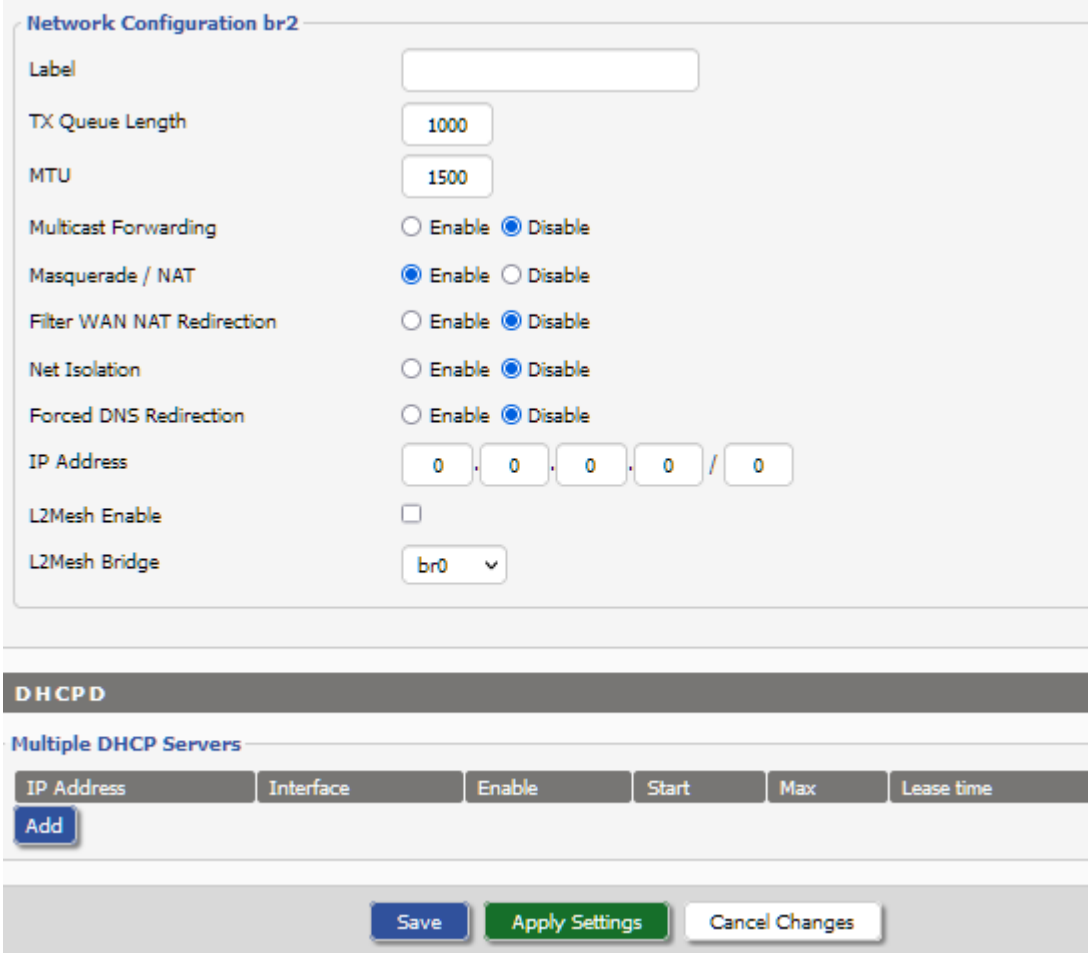
MAC Address	2C:30:33:53:5A:91
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration wl0.1

MAC Address	2E:30:33:53:5A:94
Label	
TX Queue Length	1000
Multicast to Unicast	○ Enable ◉ Disable
Bridge Assignment	◉ Default ○ Unbridged

Network Configuration br1

Label	
TX Queue Length	1000
MTU	1500
Multicast Forwarding	○ Enable ◉ Disable
Masquerade / NAT	◉ Enable ○ Disable
Filter WAN NAT Redirection	○ Enable ◉ Disable
Net Isolation	○ Enable ◉ Disable
Forced DNS Redirection	○ Enable ◉ Disable
IP Address	0 . 0 . 0 . 0 / 0
L2Mesh Enable	☐
L2Mesh Bridge	br0


Network Configuration br2
Label
TX Queue Length
1000
MTU
1500
Multicast Forwarding
Enable
Disable
Masquerade / NAT
Enable
Disable
Filter WAN NAT Redirection
Enable
Disable
Net Isolation
Enable
Disable
Forced DNS Redirection
Enable
Disable
IP Address
0 . 0 . 0 . 0 / 0
L2Mesh Enable
L2Mesh Bridge
br0
DHCPD
Multiple DHCP Servers
IP Address
Interface
Enable
Start
Max
Lease time
Add
Save
Apply Settings
Cancel Changes

Isolating subnets/bridges

Theoretically VLANs are separated at the switch level but in the end they all come together at the main router.

Main router R7800

So isolation should set at the Main router (R7800)
DDWRT bridges are by default FORWARDING to each other so there is no isolation at all and you should be able to freely connect to all subnets

To isolate DDWRT has a GUI option on all interfaces: "Net isolation" this should be enabled to isolate the bridges (br1 and br2) from br0 and from the Main router (there is a bug in builds before 49732 which prevents to isolate a bridge form the router)
However bridges are not isolated from each other (patch is pending), so that has to be done manually by adding the following rule to the firewall (

```
## isolate bridges from each other:
iptables -D FORWARD -i br1 -o br+ -m state --state NEW -j REJECT
iptables -D FORWARD -i br2 -o br+ -m state --state NEW -j REJECT
iptables -I FORWARD -i br1 -o br+ -m state --state NEW -j REJECT
iptables -I FORWARD -i br2 -o br+ -m state --state NEW -j REJECT
```

Although these rules are set at the Main router, this also applies to the WAP br1 and br2 because those are just an extension of the Main.
To put it differently the whole br1 and br2 network including the part which runs on the WAP should be isolated from br0 and the router(s)

It is possible that you have to further isolate br1 and br2 from the main router itself if you have a build before build 49732:

```
PORT_DHCP="67"
PORT_DNS="53"

# limit guests to essential router services (icmp, dns, dhcp)
for GUEST_IF in br1 br2
do
iptables -I INPUT -i $GUEST_IF -j REJECT
iptables -I INPUT -p icmp -i $GUEST_IF -j ACCEPT
iptables -I INPUT -p udp  -i $GUEST_IF --dport $PORT_DHCP -j ACCEPT
iptables -I INPUT -p tcp  -i $GUEST_IF --dport $PORT_DNS  -j ACCEPT
iptables -I INPUT -p udp  -i $GUEST_IF --dport $PORT_DNS  -j ACCEPT
done
```

This part is not tested but is hopefully enough for a complete isolation,

To research

Is STP on the bridges necessary? Probably not as they are on different subnets